

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-131973

(43)Date of publication of application : 09.05.2002

(51)Int.Cl.

G03G 9/08  
G03G 9/087  
G03G 9/09  
G03G 15/01

(21)Application number : 2000-325425

(71)Applicant : MINOLTA CO LTD

(22)Date of filing : 25.10.2000

(72)Inventor : TAMAOKI JUNICHI  
HAKI MASAYUKI  
YASUNO MASAHIRO

## (54) METHOD FOR FORMING FULL-COLOR IMAGE

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for forming a full-color image by which high-quality full-color images can be fast obtained at a low cost.

SOLUTION: In the method for forming a full-color image, a magenta developer containing a magenta toner, a cyan developer containing a cyan toner, a yellow developer containing a yellow toner, and a black developer containing a black toner are used as the developer. Each toner has 3 to 7.5  $\mu\text{m}$  volume average particle size contains at least 100 pts.wt. of a binder resin, 1 to 20 pts.wt. of a polymer (B) having 1,000 to 3,000 weight average mol.wt. and  $\leq 2.0$  ratio of weight average mol.wt./number average mol.wt., and a coloring agent. Each maximum deposition amount of the magenta toner, cyan toner and yellow toner on the recording material is controlled to  $\leq 5.0 \text{ g/m}^2$ .

## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the  
examiner's decision of rejection or application converted  
registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of  
rejection][Date of requesting appeal against examiner's decision of  
rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

**CLAIMS**


---

## [Claim(s)]

[Claim 1] A production process which forms a latent image on electrostatic latent-image support, and develops this latent image with a developer. And a production process imprinted on a recorded material, without minding a toner image formed on electrostatic latent-image support through a middle imprint object It is the full color image formation method including a toner image which carried out repeatedly for every color of a developer and was imprinted on a recorded material being established. A Magenta developer which contains a Magenta toner as a developer, a cyanogen developer containing a cyanogen toner, While each toner has volume mean particle diameter of 3-7.5 micrometers using a yellow developer containing a yellow toner, and a black developer containing a black toner at least — a binder — resin — 100 — weight — the section — weight average molecular weight — 1000 — 3000 — and — weight average molecular weight — / — number average molecular weight — 2.0 — less than — a polymer — (— B —) — one — 20 — weight — the section — and — a coloring agent — containing — becoming — A full color image formation method characterized by controlling the maximum coating weight to a recorded material of a Magenta toner, a cyanogen toner, and a yellow toner to a two or less 5.0 g/m value, respectively.

[Claim 2] A full color image formation method according to claim 1 characterized by controlling the maximum coating weight to a recorded material of a Magenta toner, a cyanogen toner, and a yellow toner to the two or less 5.0 g/m same value.

[Claim 3] A full color image formation method according to claim 1 or 2 that a polymer (B) is a homopolymer or a copolymer of an aromatic series monomer and/or an aliphatic series monomer.

[Claim 4] claims 1-3 whose glass transition points of binder resin are 50-60 degrees C — a full color image formation method given in either.

[Claim 5] a class and an amount of an after-treatment agent of a Magenta toner, a cyanogen toner, and a yellow toner — abbreviation — same claims 1-4 — a full color image formation method given in either.

---

[Translation done.]

## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the full color image formation method.

[0002]

[Description of the Prior Art] Generally, the full color image formation method forms a latent image on electrostatic latent-image support (photo conductor), and comes to contain the production process (development production process) which develops this latent image with a toner, the production process (imprint production process) imprinted on a recorded material, without minding the toner image formed on electrostatic latent-image support through a middle imprint object, and the production process (fixing production process) established in the toner image on a recorded material. After developing negatives for every color and piling up a toner layer on a recorded material in detail using the toner of four colors of a Magenta color, a yellow color, a cyanogen color, and a black color, a toner layer is established with pressurization and heating. It is common in binder resin, a coloring agent, etc. coarse grinding melting and after kneading and cooling, and to pulverize, to classify by request and to obtain the toner used for such an image formation method at least.

[0003] In recent years, in the field of the above full color image formation methods, high-definition-izing of an image, improvement in the speed of image formation, and low cost-ization are demanded, and various attempts are made about the image formation process and the toner.

[0004] For example, in order to attain high definition-ization of an image, it is known that it is effective to make mean particle diameter of a toner small. However, since the specific surface area of a toner increased by minor diameter-ization of a toner, there was orientation for the amount of toner electrifications per unit weight to become high. When the amount of electrifications became high too much, the problem that the amount of development was restricted and desired image concentration was not obtained arose. Then, in order to prevent the fall of image concentration, in JP,9-114127,A, the attempt which specifies the volume mean particle diameter of a toner, a color-material content, and the toner weight of the solid section on tracing paper is made. According to this convention, also in the diameter toner of a granule, desired image concentration is securable by raising a color-material content. However, if a color-material content was raised, since the electric charge nature of a toner would be greatly influenced by the electric charge engine performance which color material has, the maximum coating weight of development conditions and a toner [ especially as opposed to a recorded material ] needed to be changed comparatively greatly for every toner. If the difference of the maximum coating weight of the toner to the recorded material for every toner is too large, the conditioning for every toner at the time of development is complicated, and improvement in the speed and low-cost-izing of full color image formation cannot be attained. Moreover, materials other than color material needed to adjust the amount of electrifications for every toner at the time of toner manufacture.

[0005] Moreover, in the manufacturing process of a grinding mold toner, although the pulverizing production process had required long duration comparatively, it was difficult for pulverizing to take long duration further to minor diameter-ization of a toner, and for productivity to fall, and to attain low cost-ization as a result. So, the technology of making the toner constituent before kneading containing specific petroleum resin, and raising the grindability of a toner constituent is reported by JP,11-65161,A. Here, in order to secure the conservation stability of a toner as binder resin, resin 60 degrees C or more is used for a glass transition point. However, when the toner by the technology concerned was used, fixing took long duration comparatively, and improvement in the speed of full color image formation was not attained.

[0006] In order to attain improvement in the speed of full color image formation, reducing the increase of the color-material content of a toner and the coating weight [ as opposed to / carry out and / a recorded material ] of a toner and lowering the melting initiation temperature of toner binder resin are proposed. However, if the coating weight of a toner was reduced, in order that the number of configuration toners per pixel might decrease, there was a problem that the graininess of the image obtained got worse. That is, the coarse image of a texture was obtained. Moreover, when binder resin with a comparatively low melting initiation temperature was used, there was a problem that toner condensation tends to take place. That is, when a toner was comparatively saved under an elevated temperature, condensation took place, and condensation took place by churning into the development counter.

[0007]

[Problem(s) to be Solved by the Invention] This invention is made in view of the above-mentioned situation, and it aims at offering a high speed and the full color image formation method which it is cheap and can be offered for a

high definition full color image.

[0008] Even if this invention does not change the maximum coating weight of the toner to a recorded material for every toner, it aims at offering a high speed and the full color image formation method which it is cheap and can be offered for a high definition full color image again.

[0009]

[Means for Solving the Problem] A production process which this invention forms a latent image on electrostatic latent-image support, and develops this latent image with a developer. And a production process imprinted on a recorded material, without minding a toner image formed on electrostatic latent-image support through a middle imprint object. It is the full color image formation method including a toner image which carried out repeatedly for every color of a developer and was imprinted on a recorded material being established. A Magenta developer which contains a Magenta toner as a developer, a cyanogen developer containing a cyanogen toner. While each toner has volume mean particle diameter of 3-7.5 micrometers using a yellow developer containing a yellow toner, and a black developer containing a black toner at least — a binder — resin — 100 — weight — the section — weight average molecular weight — 1000 — 3000 — and — weight average molecular weight — / — number average molecular weight — 2.0 — less than — a polymer — (— B —) — one — 20 — weight — the section — and — a coloring agent — containing — becoming — It is related with a full color image formation method characterized by controlling the maximum coating weight to a recorded material of a Magenta toner, a cyanogen toner, and a yellow toner to a two or less 5.0 g/m value, respectively.

[0010] When a specific polymer (B) was used, even if he made a toner a diameter of a granule and filled up this toner with comparatively a lot of coloring agents, an artificer of this invention etc. found out that a difference of electrification level between toners of each color was reduced, and found out that the purpose of this invention was attained easily by using still such a toner on specific development conditions.

[0011]

[Embodiment of the Invention] The developer used for the method of this invention may be 2 component developer which mixes a toner and a carrier and is obtained, or may be 1 component developer which uses a toner independently. Moreover, although used combining the Magenta developer which contains a Magenta toner as a developer in this invention, the cyanogen developer containing a cyanogen toner, the yellow developer containing a yellow toner, and the black developer containing a black toner, as long as it is not limited to this and can form a full color image, you may use combining the developer of other colors.

[0012] Hereafter, although a toner is explained first, unless it mentions specially, the following explanation may be applied independently to a Magenta toner, a cyanogen toner, a yellow toner, and a black toner, respectively.

[0013] The toner used in this invention comes to contain binder resin, a specific polymer (B), and a coloring agent at least. In order to use a specific polymer (B) which is explained in full detail in this invention later, a toner has the configuration which the polymer (B) exposed to the particle surface. Since a toner has such a configuration, even if it fills up with comparatively a lot of coloring agents, the probability for a coloring agent to be exposed to the particle surface of a toner is considered that it decreases notably and the difference of the electrification level between the toners of each color based on the difference in the electrification engine performance of each coloring agent is reduced. Moreover, since a toner has the above configurations, the effect that toner condensation stops being able to happen easily is also acquired. The effect that the productivity of a toner improves is also acquired by furthermore using a polymer (B).

[0014] If a polymer (B) is used in manufacture of a toner, in a kneading production process, a polymer (B) is distributed as a particle in binder resin, and since it is ground while a grinding side is formed so that a kneading object may connect the particulate material of a polymer (B) with a grinding production process, it will be thought that the toner which has the configuration which the polymer (B) exposed to the particle surface is obtained. In detail, in the place where the polymer (B) particle in a kneading object exists, since grinding takes place not through the contact surface (interface) of binder resin and a polymer (B) particle but through the interior of a polymer (B) particle, the grinding side concerned is constituted by the polymer (B) and it is thought that a polymer (B) is exposed to the particle surface as a result.

[0015] the polymer (B) used in this invention — weight average molecular weight (Mw) — 1000-3000 — 1000-2800, and weight average molecular weight/number average molecular weight (Mw/Mn) are 1.9 or less preferably 2.0 or less. If such a polymer (B) is not used, the toner of a configuration of having exposed to the particle surface cannot be obtained, but the difference of the electrification level between the toners of each color will need to become comparatively large, and a polymer (B) will need to change the maximum coating weight comparatively greatly for every toner, and will become complicated [ the conditioning for every toner at the time of development ].

Furthermore, since the glass transition point of a polymer (B) becomes it low that Mw of a polymer (B) is less than 1000, the storage nature (heat-resistant storage nature) when leaving a toner at a comparatively high temperature gets worse, and use becomes difficult practically. On the other hand, if Mw exceeds 3000, the own grindability of material will worsen and the improvement effect of the grindability by using this material will no longer be accepted.

[0016] Mw and Mn of a polymer or resin use the value measured by gel permeation chromatography (807-IT mold; Jasco industrial company make) among this specification. The column was kept at 40 degrees C, in detail, as a carrier solvent, a tetrahydrofuran is dissolved in a sink and 30mg of samples to measure was dissolved in tetrahydrofuran 20ml by 10 kg/cm<sup>3</sup>, and 0.5mg of this solution was introduced with the above-mentioned carrier solvent, and it asked for it by polystyrene conversion.

[0017] As for such a polymer (B), it is preferably desirable the grindability characteristics 0.1-1.0 and to have 0.2-

0.6. A grindability characteristic is one index of it being ground and expressing easy, and means that it is easy to be ground, so that the value concerned is small.

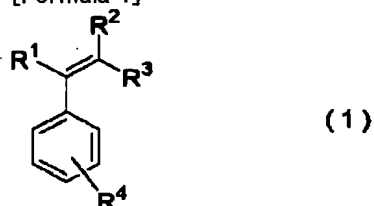
[0018] The grindability characteristic uses the value measured according to the following among this specification. In case a mechanical-cable-type grinder (KTM-0 mold: Kawasaki Heavy Industries, Ltd. make) grinds a sample with a volume mean particle diameter of about 2mm at Throughput F (5 kg/h) and the KTM rotational frequency 12000 (rpm), the load power value W1 when passing the load power value W0 and sample at the time of sample passage nothing is recorded. Then, the volume mean particle diameter D of the grinding object obtained by KTM grinding (micrometer) is measured by the coal tar multi-sizer II (made in coal tar Beckmann). Based on the following type, a grindability characteristic is computed from the acquired value.

Grindability characteristic  $= (D \times (W1 - W0)) / F$  [0019] Moreover, as for the glass transition point ( $T_g$ ) of a polymer (B), it is preferably desirable from the viewpoint of the further improvement in heat-resistant storage nature and low-temperature fixable that it is 60–80 degrees C more preferably 55–85 degrees C 50 degrees C or more. Among this specification, using the differential scanning calorimeter (DSC-200: SEIKO electronic company make), the glass transition point of a polymer or resin uses a reference as an alumina, measures a 10mg sample among 20–120 degrees C on condition that the programming rate of 10 degrees C / min, and makes the shoulder value of the Maine endothermic peak the glass transition point.

[0020] As long as it does not dissolve as a class of polymer (B) even if melting kneading of the polymer (B) is carried out with binder resin, and binder resin differs from a grindability, it is not restricted, for example, the homopolymer or copolymer of a well-known aromatic series monomer and/or an aliphatic series monomer can be used. It means that "binder resin differs from a grindability" has [ 0.5 or more / 0.7 or more ] the grindability characteristic of a polymer (B) preferably smaller than the grindability characteristic of binder resin here. By using the polymer (B) and binder resin which have the relation of such a grindability characteristic, a polymer (B) can obtain effectively the toner exposed to the surface.

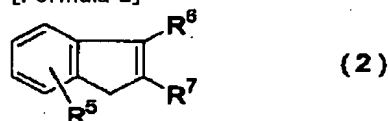
[0021] As an aromatic series monomer, it is a general formula (1);

[Formula 1]



It is [ the styrene system monomer expressed with (R1, R2, R3, and R4 being a hydrogen atom, a halogen atom or the alkyl group of carbon numbers 1–4, for example, a methyl group, an ethyl group, n-propyl group, and n-butyl independently among a formula, respectively, and being a hydrogen atom, a chlorine atom, a bromine atom, or a methyl group preferably), and ] a general formula (2);

[Formula 2]



The indene system monomer expressed with (R5, R6, and R7 being a hydrogen atom, a halogen atom or the alkyl group of carbon numbers 1–6, for example, a methyl group, an ethyl group, n-propyl group, n-butyl, n-pentyl radical, and n-hexyl group independently among a formula, respectively, and being a hydrogen atom, a chlorine atom, a bromine atom, or a methyl group preferably) is mentioned.

[0022] As an example of a styrene system monomer, for example Styrene, vinyltoluene, Alpha methyl styrene, isopropenyl toluene, beta-methyl styrene, 1-propenyl toluene, o-chloro styrene, m-chloro styrene, p-chloro styrene, alpha-chloro styrene, beta-chloro styrene, o-bromostyrene, m-bromostyrene, p-bromostyrene, alpha-bromostyrene, beta-bromostyrene, etc. are mentioned. Preferably Styrene, vinyltoluene, alpha methyl styrene, isopropenyl toluene, beta-methyl styrene and 1-propenyl toluene — more — desirable — styrene, vinyltoluene, alpha methyl styrene, and isopropenyl toluene — they are styrene, alpha methyl styrene, and isopropenyl toluene still more preferably. As an example of an indene system monomer, for example, an indene, a methyl indene, an ethyl indene, etc. are mentioned, and especially an indene is desirable also in these. In this case, it is desirable when using a pure monomer with high purity stops coloring of resin, an odor, and the amount of VOC(s) low. An aromatic series monomer is independent, or may be combined and used.

[0023] As an example of an aliphatic series monomer, especially if the above-mentioned aromatic series monomer and a polymerization are possible, it will not be restricted. For example, an isoprene, piperylene, 1,3-butadiene, 1,3-pentadiene, 1, 5-hexadiene, 2,3-dimethyl-1,3-butadiene, a chloroprene, Diolefin system monomers, such as 2-BUROMO-1,3-butadiene; Ethylene, A propylene, a butylene, an isobutylene, 2-methyl-butene-1, the monoolefin system monomer of 2-methylbutene-2 grade; A methyl acrylate, An ethyl acrylate, acrylic-acid n-propyl, acrylic-acid isopropyl, Acrylic-acid n-butyl, isobutyl acrylate, acrylic-acid t-butyl, Acrylic-acid n-pentyl, acrylic-acid isopentyl, acrylic-acid neopentyl, Acrylic-acid 3-(methyl) butyl, acrylic-acid hexyl, acrylic-acid octyl, Acrylic-acid

alkyl ester system monomers, such as acrylic-acid nonyl, acrylic-acid DESHIRU, acrylic-acid undecyl, and acrylic-acid dodecyl; A methyl methacrylate, Ethyl methacrylate, methacrylic-acid n-propyl, methacrylic-acid isopropyl, N-butyl methacrylate, methacrylic-acid isobutyl, t-butyl methacrylate, Methacrylic-acid n-pentyl, methacrylic-acid isopentyl, methacrylic-acid neopentyl, Methacrylic-acid 3-(methyl) butyl, methacrylic-acid hexyl, methacrylic-acid octyl, Methacrylic-acid nonyl, methacrylic-acid DESHIRU, methacrylic-acid undecyl, Alkyl methacrylate ester system monomers, such as methacrylic-acid dodecyl; An acrylic acid, Unsaturated-carboxylic-acid system monomers, such as a methacrylic acid, an itaconic acid, and a maleic acid; Acrylonitrile, A maleate, itaconic-acid ester, a vinyl chloride, vinyl acetate, benzoic-acid vinyl, a vinyl methyl ethyl ketone, a vinyl hexyl ketone, vinyl methyl ether, vinyl ethyl ether, the vinyl isobutyl ether, etc. are mentioned. It is a monoolefin system monomer and a diolefin system monomer preferably, and is an isoprene preferably [ it is more desirable and ] to an isoprene, piperylene, 2-methyl-butene-1, the 2-methylbutene -2, and a pan. A \*\*\*\* monomer is independent, or may be combined and used.

[0024] The homopolymer or copolymer of the aromatic series monomer whose aromatic series monomer is 1 or the monomer beyond it chosen from the group which consists of styrene, alpha methyl styrene, and isopropenyl toluene and whose aliphatic series monomer is an isoprene also in the polymer (B) which consists of the above monomers, and/or an aliphatic series monomer is desirable.

[0025] What was compounded considering the diolefin and/or monoolefin which are contained in the decomposition oil fraction by which the byproduction was carried out as such a desirable polymer (B) from the plant which manufactures ethylene, a propylene, etc. according to steam cracking of petroleum as a raw material may be used preferably.

[0026] Moreover, they are polystyrene and Polly alpha methyl styrene preferably from a viewpoint which a polystyrene, Polly alpha-methyl-styrene, and styrene-alpha-methyl-styrene copolymer, an alpha-methyl-styrene-isopropenyl toluene copolymer, a styrene-isopropenyl toluene copolymer, an alpha-methyl-styrene-isopropenyl toluene-isoprene copolymer, a styrene-isopropenyl toluene-isoprene copolymer, etc. are mentioned, and reduces further the difference of the electrification level between the toners of each color as an example of the above desirable polymers (B).

[0027] When using polystyrene as a polymer (B), as for the weight average molecular weight, it is still more desirable that it is 1000-2000. Moreover, when using Polly alpha methyl styrene as a polymer (B), as for the weight average molecular weight, it is still more desirable that it is 2000-2800.

[0028] the amount of the polymer (B) used — the binder resin 100 weight section — receiving — 1 - 20 weight section — it is 3 - 15 weight section preferably. If there is too little amount used, the improvement effect of the grindability of a toner constituent will be hard to be acquired. When there is too much amount used, a toner becomes that overgrinding is easy to be carried out, and there is orientation for toner particle size to change a lot in a development counter.

[0029] It is not restricted especially as binder resin, but well-known synthetic resin or natural resin can be used in the field of the toner for electrostatic-charge image development. For example, polyester system resin, styrene resin, a polyvinyl chloride, phenol resin, natural denaturation phenol resin, natural denaturation maleic resin, acrylic resin, methacrylic system resin, Pori acetic-acid vinyl, silicone resin, polyurethane, polyamide resin, furan resin, an epoxy resin, xylene resin, a polyvinyl butyral, terpene resin, cumarone indene resin, etc. are mentioned. Preferably, the polyester system resin which made polyester system resin or styrene-acrylic resin graft-ize is mentioned. In this invention, it is more desirable to use polyester system resin from a viewpoint of the further improvement in low-temperature fixable.

[0030] Although specifying the softening temperature of binder resin as a means which raises the low-temperature fixable one of a toner from the former was often performed, in this invention, it found out that the direction of a glass transition point correlated with low-temperature fixable one well from the softening temperature of binder resin. Therefore, as for binder resin, in this invention, it is desirable for 45-65 degrees C of the viewpoint of the further improvement in heat-resistant storage nature and low-temperature fixable to glass transition points to be 50-60 degrees C preferably. In addition, as for the softening temperature of binder resin, it is desirable that it is 120 degrees C or less from the color reproduction nature and the glossy viewpoint of a full color image.

[0031] The polyester resin obtained by carrying out the polycondensation of a polyhydric-alcohol component and the multiple-valued carboxylic-acid component as polyester system resin in this invention is usable. Among polyhydric-alcohol components, as a dihydric alcohol component For example, polyoxypropylene (2 2) -2, 2-screw (4-hydroxyphenyl) propane, Polyoxypropylene (3 3) -2, 2-screw (4-hydroxyphenyl) propane, Polyoxypropylene (6) -2, 2-screw (4-hydroxyphenyl) propane, A polyoxyethylene (2 0) -2, 2-screw (4-hydroxyphenyl) propane, The bisphenol A alkylene oxide addition products, such as a polyoxyethylene (2 2) -2 and 2-screw (4-hydroxyphenyl) propane, Ethylene glycol, a diethylene glycol, triethylene glycol, 1, 2-propylene glycol, 1, 3-propylene glycol, 1,4-butanediol, Neopentyl glycol, 1, 4-butene diol, 1,5-pentanediol, 1,6-hexanediol, 1, 4-cyclohexane dimethanol, dipropylene glycol, a polyethylene glycol, a polytetramethylene glycol, bisphenol A, hydrogenation bisphenol A, etc. are mentioned. As an alcoholic component more than trivalent, they are a sorbitol, 1, 2 and 3, 6-hexane tetrol, 1, 4-sorbitan, pentaerythritol, dipentaerythritol, tripentaerythritol, 1 and 2, 4-butane triol, 1 and 2, 5-pentanetriol, glycerol, isobutane triol, and 2-methyl, for example. - 1, 2, 4-butane triol, trimethylolethane, trimethylol propane, 1 and 3, 5-trihydroxy methylbenzene, etc. are mentioned.

[0032] Moreover, as a divalent carboxylic-acid component, the anhydride or low-grade alkyl ester of a maleic acid, a fumaric acid, a citraconic acid, an itaconic acid, glutaconic acid, a phthalic acid, isophthalic acid, a terephthalic acid,

cyclohexane dicarboxylic acid, a succinic acid, an adipic acid, sebacic acid, an azelaic acid, a malonic acid, an n-dodecenyl succinic acid, an iso dodecenyl succinic acid, n-dodecyl succinic acid, an iso dodecyl succinic acid, n-OKUTE nil succinic acid, an iso OKUTE nil succinic acid, n-octyl succinic acid, iso octyl succinic acids, and these acids be

[0033] As a carboxylic-acid component more than trivalent, for example 1,2,4-benzenetricarboxylic acid (trimellitic acid), 1, 2, 5-benzene tricarboxylic acid, 2 and 5, 7-naphthalene tricarboxylic acid, 1 and 2, 4-naphthalene tricarboxylic acid, 1, 2, 4-butane tricarboxylic acid, 1 and 2, 5-hexane tricarboxylic acid, 1 A 3-dicarboxyl-2-methyl-2-methylene carboxy propane, The anhydride of 1, 2, 4-cyclohexane tricarboxylic acid, tetrapod (methylene carboxyl) methane, 1, 2 and 7, 8-octane tetracarboxylic acid, pyromellitic acid, en pole trimer acids, and these acids, low-grade alkyl ester, etc. are mentioned.

[0034] The polyester resin obtained considering at least one sort chosen from the group which uses the bisphenol A alkylene oxide addition product as a principal component as a polyhydric-alcohol component, and consists of a terephthalic acid, a fumaric acid, a dodecenyl succinic acid, and benzene tricarboxylic acid as a multiple-valued carboxylic-acid component also in the polyester resin which consists of the above monomer components as a principal component is desirable.

[0035] The polyester resin obtained from a viewpoint of the further improvement in low-temperature fixable, using a terephthalic acid and a fumaric acid as a multiple-valued carboxylic-acid component, using polyoxypropylene (2 2) - 2, 2-screw (4-hydroxyphenyl) propane (it being called "PO") and a polyoxyethylene (2 2) -2, and 2-screw (4-hydroxyphenyl) propane (it being called "EO") as a polyhydric-alcohol component is desirable. At this time, it is still more desirable than PO to use many EO(s) and to use many fumaric acids rather than a terephthalic acid. It is for making it a glass transition point not become high too much, maintaining a desired grindability characteristic.

[0036] When using the above polyester resin as binder resin, as for the acid number, it is preferably desirable that it is 3 - 20 KOHmg/g three to 30 KOHmg/g. While raising the dispersibility of the pigment which contains carbon black by using the polyester resin of such the acid number, or an electrification control agent, the toner which has more sufficient amount of electrifications can be obtained.

[0037] In order to control the glossiness of an image in the full color toner which fixable [ as a toner for heat roller fixing ] and offset-proof nature are raised especially in this invention, and needs translucency, two kinds of polyester resin with which softening temperatures differ as polyester resin may be used. At this time, the acid number of those mixed resin should just be above-mentioned within the limits.

[0038] As a coloring agent used by this invention, the well-known pigment and well-known color which are used as a coloring agent for full color toners from the former are usable. For example, carbon black, activated carbon, black titanium oxide, aniline blue, Cull coil blue, chrome yellow, ultra marine blue, E. I. du Pont de Nemours oil red, Quinoline yellow, methylene-blue chloride, a copper phthalocyanine, the Malachite Green OKISA rate, Lamp black, a rose bengal, C. I. pigment red 48: 1, the C.I. pigment red 122, the C.I. pigment red 57:1, the C.I. pigment red 184, the C.I. pigment yellow 12, the C.I. pigment yellow 17, the C.I. pigment yellow 93, C. I. pigment yellow 97, the C.I. pigment yellow 109, C.I. pigment yellow 110, the C.I. pigment yellow 155, the C.I. pigment yellow 180, C.I. pigment yellow 185, C. I. solvent yellow 162, the C.I. pigment blue 15:1, and C.I. pigment blue 15:3 grade can be mentioned. In a black toner, some or all of a coloring agent, such as various carbon black, activated carbon, and black titanium oxide, may be replaced with the magnetic substance. As the magnetic substance, well-known magnetic-substance particles, such as a ferrite, magnetite, and iron, are usable, for example. The mean particle diameter of a magnetic particle has especially preferably desirable 0.5 micrometers or less 1 micrometer or less in the semantics which acquires the dispersibility at the time of manufacture. the case where the magnetic substance is added in viewpoints, such as scattering prevention, giving the property as a nonmagnetic toner to a toner — the addition — the binder resin 100 weight section — receiving — 0.5 - 10 weight section — desirable — 0.5 - 8 weight section — it is 1 - 5 weight section more preferably.

[0039] Although the content of a coloring agent should just be suitably determined according to the hiding power of a coloring agent, and the maximum coating weight at the time of image formation, even if it is filled up with comparatively a lot of coloring agents in this invention, since the electrification nature of the toner of each color hardly changes, using comparatively mostly is more effective. For example, when the maximum coating weight of the toner to a recorded material is 4 g/m<sup>2</sup>, the range of 6.5 - 12 weight section and the C.I. pigment blue 15:3 are used [ the C.I. pigment red 57:1 ] for the range of 4 - 8 weight section, and the C.I. pigment yellow 180 in the range of 5.5 - 10 weight section (criteria are the binder resin 100 weight section). In addition, as for the coloring agent used for the toner of a Magenta, cyanogen, and yellow, it is desirable to be used as a masterbatch ground and obtained, after carrying out melting kneading beforehand with the binder resin used, and the amount of [ at that time used ] should just become above-mentioned [ the coloring agent content in the toner obtained ] within the limits.

[0040] A toner may be made to contain an electrification control agent and a release agent by request. As an electrification control agent for a Magenta toner, a cyanogen toner, and yellow toners, the electrification control agent of the colorlessness which does not have a bad influence on the color tone of a color toner and translucency, white, or light color is usable, for example, the zinc of salicylic acid derivatives, the metal complex of chromium, a carixarene system compound, an organic boron compound, a fluorine-containing quaternary-ammonium-salt system compound, etc. are used suitably. As the above-mentioned salicylic-acid metal complex, a thing with a thing given [ as an organic boron compound ] in JP,2-221967,A with a thing [ given in JP,53-127726,A, JP,62-145255,A, etc. ] given [ as a carixarene system compound ] in JP,2-201378,A etc. is usable.

[0041] A wax is used as a release agent. As a wax, a well-known wax is usable in the field of the toner for



electrostatic-charge image development, for example, polyethylene wax, a polypropylene wax, carnauba wax, a rice wax, a SAZORU wax, a montan ester wax, the Fischer Tropsch wax, paraffin wax, etc. can be mentioned. Desirable especially as for the melting point of a desirable wax, it is 50-90 degrees C to use the wax of the low melting point from a viewpoint of the further improvement in low-temperature fixable and improvement in the separability from a fixing roller. The addition of a release agent has desirable 0.5 - 5 weight section to the binder resin 100 weight section.

[0042] It faces obtaining a toner, and first, after mixing the above-mentioned binder resin, a polymer (B), a coloring agent and other additives, for example, a release agent, an electrification control agent, etc. with well-known mixed equipments, such as a Henschel mixer, melting kneading is carried out with well-known kneading equipment, it cools, and a kneading object is obtained. Subsequently, a kneading object is ground and classified and carries out momentary heat-treatment by request. Finally in this invention, 3-7.5 micrometers of volume mean particle diameter of a toner particle are 4-6.5 micrometers preferably. If particle size is too small, the condensation at the time of past [ the high one ], the time of storage and supply, and development will serve as [ the adhesion force between toners ] a technical problem according to increase of the surface area of a toner. If particle size is too large, level of graininess (fineness of a texture) required as a full color image cannot be attained. As equipment for performing momentary heat-treatment, a SAFUYUJINGU system (Japanese pneumatic industrial company make) is usable, for example.

[0043] To a toner, it is desirable to add various organic one / inorganic particle (after-treatment agent) for the purpose of grant of a fluidity or cleaning nature. As a non-subtlety particle, for example Silicon carbide, boron carbide, titanium carbide, Zirconium carbide, hafnium carbide, vanadium carbide, tantalum carbide, Carbonization niobium, tungsten carbide, chromium carbide, carbonization molybdenum, calcium carbide, Various carbide, such as a diamond carbon lactam, boron nitride, titanium nitride, Various borides, such as various nitrides, such as zirconium nitride, and zirconium boride, Titanium oxide, a calcium oxide, a magnesium oxide, a zinc oxide, copper oxide, Various oxides, such as an aluminum oxide, a silica, and colloidal silica, titanate-acid calcium, Various titanate-acid compounds, such as titanate-acid magnesium and strontium titanate, Various fluorides, such as various sulfides [ such as molybdenum disulfide ], magnesium fluoride, carbon, etc. fluoride, independent in various nonmagnetic inorganic particles, such as various metallic soap, such as aluminum stearate, calcium stearate, zinc stearate, and magnesium stearate, talc, and a bentonite, -- or it can combine and use.

[0044] As an organic particle, particles, such as the styrene system which corned for the purpose, such as a cleaning assistant, by wet polymerization methods, such as an emulsion-polymerization method, a soap free emulsion-polymerization method, and a nonaqueous distribution polymerization method, a gaseous-phase method, etc., acrylic (meta), benzoguanamine, a melamine, Teflon (registered trademark), silicon, polyethylene, and polypropylene, can be used.

[0045] As for a non-subtlety particle especially a silica, titanium oxide, an alumina, a zinc oxide, etc., it is desirable that surface treatment is carried out by the well-known method from a viewpoint of heat-resistant storage nature and environmental-proof stability using processing agents which have the hydrophobing processing agent currently used from the former, such as a silane coupling agent, a titanate system coupling agent, silicone oil, and a silicone varnish, a fluorine system silane coupling agent, fluorine system silicone oil, an amino group, and a quarternary-ammonium-salt radical, such as a coupling agent and denaturation silicone oil.

[0046] the configuration of the particle (after-treatment agent) \*(ed) by a Magenta toner, a cyanogen toner, and the yellow toner outside in this invention -- abbreviation same -- suppose that it is desirable and the same. Here, a configuration shall be judged for all the after-treatment agents by which it is [ abbreviation ] "identitas" or "it is the same" were added more than the 0.3 weight section to the toner 100 weight section in each toner, and a class and an amount shall mean that "abbreviation identitas" or the "same" after-treatment agent is added in common in each toner, respectively. what the class of after-treatment agent includes the chemical formula with which the raw material of a particle is expressed, and primary [ an average of ] particle size, and is meant -- carrying out -- especially -- the class of after-treatment agent -- abbreviation -- being the same -- a chemical formula with the particle raw material same irrespective of the existence of surface treatment -- it can express -- and -- this -- the first [ an average of ] particle size in each toner of the after-treatment agent expressed with the same chemical formula means that it is within the limits which is \*\*20% of those averages, respectively moreover, the amount of an after-treatment agent -- abbreviation -- being the same -- the above -- it means that the addition (addition to the toner 100 weight section) in each toner of the after-treatment agent expressed with the same chemical formula is within the limits of \*\*20% of those averages, respectively. Since the development nature and imprint nature of a toner will change for every color of a toner if the configurations of an after-treatment agent differ for every color of a toner, it will be necessary to design development conditions etc. for every color of a toner. Being designed similarly is desirable although you may be the Magenta toner of the above [ a black toner ] for low-cost-izing, a cyanogen toner and a yellow toner, and the toner of a separate installation meter in this invention.

[0047] It is desirable to the toner 100 weight section 0.05 - 5 weight section and to carry out 0.1-3 weight section addition of the above-mentioned particle preferably. The above-mentioned particle may be used combining it two or more sorts, and those total quantities should just be above-mentioned within the limits in that case.

[0048] The carrier which can use the thing better known than before as a carrier for 2 component developers as a carrier used in order to use the above toners as a 2 component developer, for example, consists of magnetic-substance particles, such as iron and a ferrite, the resin coat carrier which comes to cover such a magnetic-substance particle with resin, or the binder mold carrier which comes to distribute the impalpable powder of a

magnetic-substance particle in binding resin can be used. It is desirable from viewpoints, such as toner SUPENTO, to use the resin coat carrier which used silicone system resin, the copolymerization resin (graft resin) of organopolysiloxane and a vinyl system monomer, or polyester system resin as covering resin also in these carriers, and the carrier which the resin which isocyanate was made to react to the copolymerization resin of organopolysiloxane and a vinyl system monomer, and was obtained especially covered is desirable from a viewpoint of endurance, environmental-proof stability, and SUPENTO-proof nature. The monomer which has substituents, such as a hydroxyl group which has isocyanate and reactivity as the above-mentioned vinyl system monomer, is used preferably. Moreover, as for the volume mean particle diameter of a carrier, it is preferably desirable from high-definition reservation and a viewpoint of carrier fogging prevention to use a 20-60-micrometer thing 20-100 micrometers.

[0049] Subsequently, the full color image formation method of this invention is explained. The full color image formation method of this invention is characterized by controlling the maximum coating weight to the recorded material of using a developer which was mentioned above and a Magenta toner, a cyanogen toner, and a yellow toner to a comparatively small value in the well-known full color image formation method.

[0050] The production process developed with the developer which formed the latent image on electrostatic latent-image support (photo conductor), and mentioned this latent image above in detail, And the production process imprinted on a recorded material, without minding the toner image formed on electrostatic latent-image support through a middle imprint object In the full color image formation method including the toner image which carried out repeatedly for every color of a developer and was imprinted on the recorded material being established the maximum coating weight to the recorded material of a Magenta toner, a cyanogen toner, and a yellow toner — respectively — two or less 5.0 g/m — desirable — 2 - 5.0 g/m<sup>2</sup> — it controls to the value of 3.0 - 4.8 g/m<sup>2</sup> more preferably. By using a specific developer in this way in this invention with the specific "maximum coating weight" of the toner to a recorded material", about a high definition full color image, it is cheap and it becomes possible a high speed and to provide. If the above-mentioned coating weight exceeds 5.0g/m<sup>2</sup>, comparatively, fixing at low temperature becomes difficult, and since a comparatively high fixing temperature and/or comparatively long time amount are required for attaining sufficient fixing, improvement in the speed and low-cost-izing of full color image formation cannot be attained to coincidence.

[0051] When using said developer above "the maximum coating weight of the toner to a recorded material" in this invention, the complicatedness of the conditioning for every toner at the time of development can be mitigated by making the "maximum coating weight to a recorded material" of a Magenta toner, a cyanogen toner, and a yellow toner into within the limits of \*\*5% of those averages, respectively. That is, mitigating the complicatedness of the conditioning for every toner at the time of development, about a high definition full color image, it is cheap and it becomes possible a high speed and to provide. Without changing the maximum coating weight of the toner to a recorded material for every toner by controlling further in this invention to the same value of above-mentioned [ the maximum coating weight to the recorded material of a Magenta toner, a cyanogen toner, and a yellow toner ] within the limits, about a high definition full color image, it is cheap and it becomes possible a high speed and to provide.

[0052] In this invention, it is desirable to control like [ the maximum coating weight to the recorded material of a black toner ] the maximum coating weight of a Magenta toner, a cyanogen toner, and a yellow toner. By controlling such, it is because it becomes possible about a high definition full color image a high speed and to be cheap and to provide still more easily. When for that using carbon black as a coloring matter, it is desirable to fully distribute carbon black.

[0053] In this invention, "the maximum coating weight to the recorded material of a toner" is "a peak of the toner which finally appears on a recorded material", and is one of the conditions beforehand set up for every toner in full color image formation equipment.

[0054] "The maximum coating weight to the recorded material of a toner" is determined depending on "the peak (henceforth the photo conductor maximum coating weight) of the toner to which development may adhere at electrostatic latent-image support" and "the imprint effectiveness (when not using a middle imprint object) from electrostatic latent-image support to a recorded material", or "the imprint effectiveness and the imprint effectiveness (when using a middle imprint object) from a middle imprint object to a recorded material" from electrostatic latent-image support to a middle imprint object. The photo conductor maximum coating weight is determined by the potential of the image section in electrostatic latent-image support and the potential of the non-image section, the surface potential of developer support, the distance of electrostatic latent-image support and developer support, the magnetism of a carrier, resistance of a carrier, the amount of conveyances of the developer to a developer support top, the peripheral-speed ratio of developer support and electrostatic latent-image support, etc.

[0055] Hereafter, the case where a full color image is formed using the above-mentioned image formation method is explained briefly. First, the photo conductor (electrostatic latent-image support) of a photo conductor drum is charged in homogeneity with a primary electrification vessel, the laser light modulated with the Magenta picture signal of a manuscript performs image exposure, and an electrostatic latent image is formed on a photoconductor drum. Next, after developing this electrostatic latent image with the Magenta development counter which holds the developer containing a Magenta toner and forming a Magenta toner image on a photoconductor drum, this Magenta toner image is imprinted to the conveyed recorded material with an imprint electrification vessel. On the other hand, the photo conductor drum after the Magenta toner image was imprinted is discharged with the electrification vessel for electric discharge, and is cleaned by the cleaning means. After developing after that this electrostatic latent

image by the developer which contains electrification with the primary electrification machine of a photo conductor drum, formation of the electrostatic latent image to photo conductor drum lifting by the image exposure using a cyanogen picture signal, and a cyanogen toner again like the formation method of the above-mentioned Magenta toner image, the cyanogen toner image to the recorded material with which the above-mentioned Magenta toner image is imprinted is imprinted. Furthermore, formation of a yellow toner image and formation of a black toner image are performed like the formation method of the above-mentioned Magenta toner image one by one, and the color toner image of four colors is imprinted to a recorded material, and it is established with pressurization and heating according the imprinted full color image to a fixing roller etc.

[0056] Even if it changes the formation sequence of each color picture, there is especially no problem. Moreover, in the above-mentioned explanation, although the configuration which carries out the sequential imprint of each color toner image directly to a recorded material was shown, after piling up each color toner image to middle imprint objects, such as a middle imprint belt, and carrying out a sequential imprint to them, a superposition image may be collectively imprinted to a recorded material.

[0057] The full color image formation method of this invention is faced actually carrying out. Since the sensitivity of a photo conductor and the electrification property of a developer may be changed and "the photo conductor maximum coating weight (maximum coating weight to the recorded material of a toner)" may be changed with change of the operating environments (temperature, humidity, etc.) of the equipment which adopted the method concerned, It is desirable to perform automatic concentration control (automatic control of the photo conductor maximum coating weight) about each of the toner of a color with which plurality differs periodically.

[0058] Automatic concentration control is amending the photo conductor maximum coating weight to a regular value by forming a criteria toner image (solid image) on electrostatic latent-image support according to predetermined development conditions, and changing suitably strange good development conditions, such as potential of the image section in electrostatic latent-image support and potential of the non-image section, and surface potential of developer support, based on the coating weight of this criteria toner image.

[0059] While a desirable mode small performs the above-mentioned automatic concentration control, measures the surface potential of the electrostatic latent-image support charged on condition that predetermined with a surface potential measurement means for every fixed period and makes a storage means memorize the measured value The last measured value memorized by this measured value and the storage means is compared, when the amount of fluctuation is larger than a predetermined value, said automatic concentration control is performed, and in being smaller than a predetermined value, it controls to maintain the last development conditions, without performing said automatic concentration control. When performing automatic concentration control, by the time the image of the 1st sheet outputs, the latency time for dozens of seconds will occur, but if control according to the amount of fluctuation of the surface potential of the above electrostatic latent-image support performs, since the automatic concentration control with a comparatively small effect is no longer performed and the count of automatic concentration control of activation will be effectively reduced as a result, working capacity improves.

[0060] The 1st mode in which form a criteria toner image about each of the toner of a color with which plurality differs according to the amount of fluctuation of the surface potential of said electrostatic latent-image support, and development conditions are set up in another desirable mode in case automatic concentration control is performed, A criteria toner image is formed only about the predetermined color of the toners of a color with which plurality differs, development conditions are set up, and the 2nd mode in which the development conditions of other colors are set up is chosen based on the development conditions of this predetermined color. If selection based on the amount of fluctuation of the surface potential of such electrostatic latent-image support is performed, since [ which not necessarily performs automatic concentration control about the toner of all colors / being required ] it is lost and the count of activation of automatic concentration control is effectively reduced as a result, working capacity will improve.

[0061] In the method of this invention, aiming at further improvement in working efficiency by adopting combining the two above-mentioned desirable modes, over a long period of time, it is high-speed and cheap and a high definition full color image can be offered.

[0062]

[Example] (Manufacture of binder resin (polyester resin)) The alcoholic component and the acid component were put into the four glass opening flask furnished with a thermometer, a stirrer, a flowing-down type capacitor, and a nitrogen installation pipe with the polymerization initiator (dibutyl tin oxide) by the mole ratio shown in a table 1. It was made to react, agitating this at 220 degrees C under nitrogen-gas-atmosphere mind in a mantle heater, and polyester resin A1 and A2 was obtained. The obtained polyester resin had physical properties as shown in a table 1. In addition, EO is among a table and PO is a polyoxyethylene (2 2) about polyoxypropylene (2 2) -2 and 2-screw (4-hydroxyphenyl) propane. - TPA expresses a terephthalic acid and FA expresses a fumaric acid for 2 and 2-screw (4-hydroxyphenyl) propane.

[0063]

[A table 1]

ポリエステル 樹脂	アルコール成分		酸成分		Mn	Mw/Mn	Tg (°C)	Tm (°C)	酸価 (KOHmg/g)	水酸価 (KOHmg/g)	粉碎性 指数
	PO	EO	FA	TPA							
A1	1.0	10.0	7.0	2.0	3500	3.6	55.4	98.0	4.8	29.1	2.2
A2	10.0	1.0	—	9.0	3900	3.8	64.5	100.2	3.8	27.4	1.8

## [0064] (Manufacture of a polymer (B))

– 1.5g of BF<sub>3</sub>–phenol complexes was dropped in [ small quantity / every ] about 10 minutes, having taught resin B1 styrene (99.9% of purity) 150g, and toluene 150g to the autoclave, and keeping temperature at 5 degrees C under stirring. Then, stirring was continued for further 3 hours. Next, after having added 50ml of sodium–hydroxide aqueous solutions 5%, stirring violently for 30 minutes and decomposing a catalyst, the water layer was separated, further, after rinsing until it became neutrality about polymerized oil, an unreacted oil and solvent toluene were distilled off and polystyrene 120g was obtained as residue. The polymer concerned was used as resin B1, and physical properties were shown in a table 2.

[0065] – 1.5g of BF<sub>3</sub>–phenol complexes was dropped in [ small quantity / every ] about 10 minutes, having taught 150g [ of resin B-2 alpha methyl styrene ] (99.8% of purity), and toluene 150g to the autoclave, and keeping temperature at 5 degrees C under stirring. Then, stirring was continued for further 3 hours. Next, after having added 50ml of sodium–hydroxide aqueous solutions 5%, stirring violently for 30 minutes and decomposing a catalyst, the water layer was separated, further, after rinsing until it became neutrality about polymerized oil, an unreacted oil and solvent toluene were distilled off and 120g of Polly alpha methyl styrene was obtained as residue. The polymer concerned was made into resin B-2, and physical properties were shown in a table 2.

[0066] – 250g [ of resin B3 alpha methyl styrene ] (99.8% of purity) and isopropenyl toluene 250g and toluene 500g are put into a three-neck flask, and a 3 fluorine boron phenol complex is added small quantity every under churning, and it was made to react at 20 degrees C for 3 hours, cooling by the dry ice acetone bath. Subsequently, alkali was added, deactivation of the catalyst was carried out, and it removed, it condensed in order to drive out a solvent and an unreacted monomer, and the alpha-methyl-styrene-isopropenyl toluene copolymer was obtained as residue. The polymer concerned was used as resin B3, and physical properties were shown in a table 2.

[0067] – Resin B4 isopropenyl toluene (98% of purity) 200g, 200g [ of alpha methyl styrene ] (98% of purity), 120g [ of C5 system petroleum fractions obtained by the pyrolysis of petroleum naphtha ] (isoprene), and toluene 500g is put into a three-neck flask, and a 3 fluorine boron phenol complex is added small quantity every under churning, and it was made to react for 3 hours, cooling by the dry ice acetone bath. Next, after having added the NaOH aqueous solution, agitating violently and decomposing a catalyst, the aqueous phase was separated and the oil-like polymerization object was obtained. After rinsing an oil-like polymerization object furthermore until it became neutrality, heating reduced pressure distilling off of an unreacted oil and the solvent was carried out, and the massive white alpha-methyl-styrene-isopropenyl toluene-isoprene copolymer as residue was obtained. The polymer concerned was made into resin B4 and physical properties were shown in a table 2.

[0068] – Polystyrene was obtained by the same process as resin B1 except having made resin B5 reaction time into 2 hours. The polymer concerned was made into resin B5 and physical properties were shown in a table 2.

– Polly alpha methyl styrene was obtained by the same process as resin B-2 except having made resin B6 reaction time into 4.5 hours. The polymer concerned was made into resin B6 and physical properties were shown in a table 2.

## [0069]

[A table 2]

重合体 (B)		Mw	Mn	Mw/Mn	Tg (°C)	粉碎性 指数
B1	ポリスチレン	1500	1000	1.5	62	0.3
B2	ポリ-α-メチルスチレン	2800	1500	1.9	75	0.5
B3	α-メチルスチレン-イソプロペン トルエン共重合体	2400	1500	1.6	72	0.5
B4	α-メチルスチレン-イソプロペン トルエン-イソプレン共重合体	1900	1100	1.7	65	0.3
B5	ポリスチレン	900	650	1.4	40	0.2
B6	ポリ-α-メチルスチレン	3100	1700	1.8	88	0.7

[0070] (Manufacture of a pigment masterbatch) The pigment used for manufacture of a full color toner was used as

a pigment masterbatch obtained by the following methods. The binder resin and the pigment which are used in each example or the example of a comparison were taught to the pressurized kneader at a rate of the weight ratio (resin: pigment) 7:3, and it kneaded at 120 degrees C for 1 hour. Coarse grinding was carried out by the hammer mill after cooling, and the pigment masterbatch of 30 % of the weight of pigment content was obtained. As a pigment, C.I.Pigment Yellow180 (Hoechst A.G. make), C.I.Pigment Blue 15-3 (Dainippon Ink make), and C.I.Pigment Red 57-1 (Dainippon Ink make) were used.

[0071] After having used toner M1 polyester resin A1 and a pigment masterbatch so that it might become the polyester resin A1;100 weight section and C.I.Pigment Red57-1;5 weight section, carrying out 10 weight sections addition of the resin B1 at this and mixing with a Henschel mixer, melting kneading was carried out by the extruder. coarse grinding after cooling the obtained kneading object -- and it pulverized and the grinding object with a volume mean particle diameter of 5.5 micrometers was obtained. Then, the grinding object was classified and the toner particle with a volume mean particle diameter of 6 micrometers was obtained. After adding the hydrophobic silica (H2000; Hoechst A.G. make) 0.9 weight section, the hydrophobic titanium oxide (particle size of 50nm) 0.9 weight section, and the strontium titanate (particle-size [ of 350nm ], BET specific surface area9m2/g) 2.0 weight section and carrying out mixed processing with a Henschel mixer to this toner particle 100 weight section, the Magenta toner (M1) was obtained.

[0072] The toner Y1 and C1 pigment masterbatch were changed, and toners Y1 and C1 were obtained by the same process as a toner M1 except having used polyester resin A1 and a pigment masterbatch so that it might become the polyester resin A1;100 weight section and C.I.Pigment Yellow180;8.5 weight section or polyester resin A1;100 weight section, and C.I.Pigment Blue15-3;7 weight section.

[0073] The toner K1 pigment masterbatch was changed into carbon black (mho gal L; Cabot Corp. make; pH2.5; primary [ an average of ] particle size of 24nm), and the toner K1 was obtained by the same process as a toner M1 except having used polyester resin A1 and carbon black so that it might become the polyester resin A1;100 weight section and the carbon black;8 weight section.

[0074] Toners M2-M12 were obtained by the same process as a toner M1 except having used the binder resin, polymer (B), and pigment masterbatch which were shown in toner M2 - M12 table 3 - a table 5 so that it might become the written toner presentation. Toners Y2-Y12 were obtained by the same process as a toner Y1 except having used the binder resin, polymer (B), and pigment masterbatch which were shown in toner Y2 - Y12 table 3 - a table 5 so that it might become the written toner presentation.

[0075] Toners C2-C12 were obtained by the same process as a toner C1 except having used the binder resin, polymer (B), and pigment masterbatch which were shown in toner C2 - C12 table 3 - a table 5 so that it might become the written toner presentation.

Toners K2-K12 were obtained by the same process as a toner K1 except having used the binder resin, the polymer (B), and carbon black which were shown in toner K2 - K12 table 3 - a table 5 so that it might become the written toner presentation.

[0076] It used combining the toner shown in a table 3 - a table 5, and an example and example of comparison each example, or the example of a comparison estimated the following items.

[0077] (Productivity) When a mechanical-cable-type grinder (KTM-0 mold; Kawasaki Heavy Industries, Ltd. make) ground a sample (toner constituent (what carried out 2mm mesh pass with the feather mill after kneading cooling)) at Throughput F (5 kg/h) and the KTM rotational frequency 12000 (rpm), the load power value W1 when passing the load power value W0 and sample at the time of sample passage nothing was recorded. Then, the volume mean particle diameter D of the grinding object obtained by KTM grinding (micrometer) was measured by the multi-sizer II (made in coal tar Beckmann). The grindability characteristic was computed based on the following type, and it evaluated according to the following ranks. In addition, evaluation was performed about each toner and the average was shown.

Grindability characteristic (H) =  $(D_x (W1 - W0)) / F$  [0078]

O;  $1.0 \leq H < 1.5$ ;

O;  $0.5 \leq H < 1.0$  or  $1.5 \leq H < 2.0$ ;

x;  $H < 0.5$  (too soft) or  $2.0 \leq H$  (too hard).

[0079] (Heat-resistant storage nature) After leaving toner 10g under a 50-degree C elevated temperature for 24 hours, the state of aggregation of a toner was observed visually. In addition, evaluation was performed about each toner and the worst result was shown.

O : the aggregate was not seen at all;

O : although the aggregate existed, it got loose with the weak impact;

x: The aggregate existed and it did not get loose easily.

[0080] (Electrification nature) The amount of electrifications of each toner was measured with the electric-field separation method. The average was calculated from the amount of electrifications of a Magenta toner, a yellow toner, a cyanogen toner, and a black toner. The difference of the amount of electrifications of each toner and the average concerned was searched for, and it asked for the rate (X (%)) of the difference concerned to the average. The rate concerned was evaluated according to the following ranks. In addition, evaluation was performed about each toner and the worst result was shown. The carrier used the acrylic denaturation silicone coat ferrite carrier.

O;  $-5 \leq X \leq 5$  (%);

O;  $-10 \leq X < -5$  (%) or  $5 < X \leq 10$  (%);

x;  $X < -10$  (%) or  $10 < X$  (%).

[0081] the following evaluation — a toner — an acrylic denaturation silicone coat ferrite carrier and a toner — 2 component developer prepared and obtained so that a mixing ratio might become 5% of the weight was used.

[0082] (Graininess) A Magenta, yellow, cyanogen, and 2 component developer of black were carried in the digital full colour copying machine (CF910; Minolta Co., Ltd. make) with which the toner maximum coating weight was set as the value shown in a table 3 – a table 5, and Society of Electrophotography of Japan chart 1995 No 5-1 was copied.

O; it was better than the graininess of the present product.;

x; it was inferior to the graininess of the present product.

[0083] (Low-temperature fixable) 1.5cmx1.5cm 3 color superposition image (a Magenta toner, a yellow toner, and cyanogen toner) was printed, carrying a Magenta, yellow, cyanogen, and 2 component developer of black in the digital full colour copying machine (CF910; Minolta Co., Ltd. make) set as the value which the maximum coating weight of each toner shows in a table 3 – a table 5, and changing fixing temperature by 2-degree-C unit in the range of 120 degrees C – 170 degrees C. The image was bent from middle to two and viewing estimated the detachability of the image. Temperature between the fixing temperature when an image bending and exfoliating to the section circumference and fixing temperature when an image bends and only the section exfoliates was made into fixing minimum temperature.

O; fixing minimum temperature was less than 145 degrees C.;

O; fixing minimum temperature was 145 degrees C or more less than 155 degrees C.;

\*\*; fixing minimum temperature was 155 degrees C or more less than 165 degrees C.; (practically with no problem)

x; fixing minimum temperature was 165 degrees C or more (practically problematic).

[0084]

[A' table 3]

		粒径 ( $\mu\text{m}$ )	トナー組成			付着量 ( $\text{g}/\text{m}^2$ )	評価				
			パインダー 樹脂	重合体(B) 種/部*	着色剤** 使用量(部)		生産性	耐熱 保管性	粒状性	帯電性	低温 定着性
実施例1	トナーM1	6	A1	B1/10	5	4.5	◎	○	○	◎	◎
	トナーY1	6	A1	B1/10	8.5						
	トナーC1	6	A1	B1/10	7						
	トナーK1	6	A1	B1/10	8						
実施例2	トナーM2	6	A1	B2/10	5	4.5	◎	◎	○	◎	○
	トナーY2	6	A1	B2/10	8.5						
	トナーC2	6	A1	B2/10	7						
	トナーK2	6	A1	B2/10	8						
実施例3	トナーM3	6	A1	B3/10	5	4.5	◎	◎	○	○	○
	トナーY3	6	A1	B3/10	8.5						
	トナーC3	6	A1	B3/10	7						
	トナーK3	6	A1	B3/10	8						
実施例4	トナーM4	6	A1	B4/10	5	4.5	◎	○	○	○	◎
	トナーY4	6	A1	B4/10	8.5						
	トナーC4	6	A1	B4/10	7						
	トナーK4	6	A1	B4/10	8						
実施例5	トナーM5	6	A1	B1/5	5	4.5	○	○	○	○	◎
	トナーY5	6	A1	B1/5	8.5						
	トナーC5	6	A1	B1/5	7						
	トナーK5	6	A1	B1/5	8						

\*パインダー樹脂100重量部に対する重合体(B)の使用量を示す。

\*\*パインダー樹脂100重量部に対する着色剤の使用量を示す。

[0085]

[A table 4]

	粒径 ( $\mu\text{m}$ )	トナー組成			付着量 ( $\text{g}/\text{m}^2$ )	評価				
		バインダー 樹脂	重合体 (B) 種/部*	着色剤** 使用量 (部)		生産性	耐熱 保管性	粒状性	帯電性	低温 定着性
実施例6	トナーM6	A1	B1/10	6.5	3.5	◎	○	○	○	◎
	トナーY6	A1	B1/10	11						
	トナーC6	A1	B1/10	9						
	トナーK6	A1	B1/10	8						
実施例7	トナーM7	A2	B1/10	5	4.5	◎	○	○	◎	△
	トナーY7	A2	B1/10	8.5						
	トナーC7	A2	B1/10	7						
	トナーK7	A2	B1/10	8						
比較例1	トナーM8	A1	-/0	5	4.5	×	×	○	×	○
	トナーY8	A1	-/0	8.5						
	トナーC8	A1	-/0	7						
	トナーK8	A1	-/0	8						
比較例2	トナーM9	A1	B1/25	5	4.5	×	○	○	◎	○
	トナーY9	A1	B1/25	8.5						
	トナーC9	A1	B1/25	7						
	トナーK9	A1	B1/25	8						
比較例3	トナーM10	A1	B1/10	3.5	7	◎	○	×	◎	△
	トナーY10	A1	B1/10	6						
	トナーC10	A1	B1/10	5.3						
	トナーK10	A1	B1/10	8						

\*バインダー樹脂100重量部に対する重合体 (B) の使用量を示す。

\*\*バインダー樹脂100重量部に対する着色剤の使用量を示す。

[0086]

[A table 5]



		粒径 ( $\mu\text{m}$ )	トナー組成			付着量 ( $\text{g}/\text{m}^2$ )	評価				
			バインダー 樹脂	重合体(B) 種/部*	着色剤** 使用量(部)		生産性	耐熱 保管性	粒状性	帯電性	低温 定着性
比較例4	トナ-M11	6	A1	B5/10	5	4.5	◎	×	○	×	◎
	トナ-Y11	6	A1	B5/10	8.5						
	トナ-C11	6	A1	B5/10	7						
	トナ-K11	6	A1	B5/10	8						
比較例5	トナ-M12	6	A1	B6/10	5	4.5	○	◎	○	×	△
	トナ-Y12	6	A1	B6/10	8.5						
	トナ-C12	6	A1	B6/10	7						
	トナ-K12	6	A1	B6/10	8						

\*バインダー樹脂100重量部に対する重合体 (B) の使用量を示す。

\*\*バインダー樹脂100重量部に対する着色剤の使用量を示す。

[0087] (Manufacture of an acrylic denaturation silicone coat ferrite) It is 100 weight \*\*\*\*\* about a methyl ethyl ketone at a flask with an equipped with a stirrer, a capacitor, a thermometer, a nitrogen installation pipe, and dropping equipment capacity of 500ml. Under nitrogen-gas-atmosphere mind, at 80 degrees C, the solution which was made to dissolve the methyl methacrylate 86.7 weight section, 2-hydroxyethyl methacrylate 5.1 weight section, 3-methacryloxypropyl tris (trimethylsiloxy) silane 58.2 weight section and 1, and 1'-azobis (cyclohexane-1-carbonitrile) 1 weight section in the methyl-ethyl-ketone 100 weight section, and was obtained was dropped into the rear-spring-supporter reactor in 2 hours, and was ripened for 5 hours. after adjusting isophorone diisocyanate / trimethylol propane adduct (IPDI/TMP system: NCO%=6.1%) as a cross linking agent to the obtained resin so that the OH/NCO mole fraction may become 1/1 — a methyl ethyl ketone — diluting — a fixed ratio — the coat resin solution which is 8 % of the weight was prepared.

[0088] Using the baking ferrite powder F-800 (volume mean particle diameter: micrometers [ 50 ], Powdertech make) as core material, the above-mentioned coat resin solution was applied and dried with Spira Cota (Okada elaborate company make) so that the amount of covering resin to core material might become 1.5% of the weight. In hot blast circuit system oven, at 160 degrees C, the obtained carrier was left for 1 hour and calcinated. The ferrite powder bulk after cooling was cracked using the sieve shaker which attached 106 micrometers of openings, and a 75-micrometer screen mesh, and the acrylic denaturation silicone coat ferrite carrier was obtained.

[0089] (Other measuring methods)

- Temperature which is equivalent to one half of the height of the point ending [ outflow ] from the outflow start point when carrying out the melting outflow of the sample of 3 1cm on condition that the pore (the path of 1mm, a length of 1mm) of a dice, 30kg/cm<sup>2</sup> of pressurization, and the programming rate of 3 degrees C / min was made into softening temperature using the measuring method flow tester (CFT-500: Shimadzu Corp. make) of the softening temperature T<sub>m</sub> of resin.

- The acid number is the value which dissolved the 10mg sample in toluene 50ml, titrated using the mixed indicator of 0.1% of bromthymol blue, and Phenol Red with N / 10 potassium hydroxides / alcoholic solution by which standardization was carried out beforehand, and was computed from the consumption of N / 10 potassium hydroxides / alcoholic solution.

[0090] - The particle size of a toner was measured using the coal tar multi-sizer II.

- The mean particle diameter of an inorganic particle was observed with the transmission electron microscope (JEM-1010 mold; the JEOL datum company make), measured the diameter of 100 particles, and asked for mean particle diameter.

[0091]

[Effect of the Invention] By this invention, it is high-speed and cheap and a high definition full color image can be offered.

---

[Translation done.]

(19) 日本国特許庁 (J P) (12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2002-131973

(P2002-131973A)

(43) 公開日 平成14年5月9日(2002.5.9)

(5) Int.Cl. <sup>7</sup>	G 03 G	9/08	3 6 5	3 7 1	9/087	9/08	15/01	9/08	3 2 1	11 3 A	J	マゼンタトナー、シアントトナーおよびイエロートナーを含む複色剤を有するフルカラー画像形成方法
識別記号	G 03 G	9/08	3 6 5	3 7 1	9/087	9/08	15/01	9/08	3 2 1	11 3 A	J	マゼンタトナー、シアントトナーおよびイエロートナーを含む複色剤を有するフルカラー画像形成方法
特許請求の範囲												マゼンタトナー、シアントトナーおよびイエロートナーを含む複色剤を有するフルカラー画像形成方法

(21) 出願番号	特開2000-325425(P2000-325425)	(71) 出願人	00006079
(22) 出願日	平成12年10月25日(2000.10.25)	(72) 発明者	玉置 順一
		(73) 発明者	大塚 雅之
		(74) 代理人	100062144
			弁理士 青山 漢 (外1名)

(54) 【発明の名称】 フルカラー画像形成方法

【要約】 高画質なフルカラー画像を高速かつ安価で提供できるフルカラー画像形成方法を提供すること。  
【解決手段】 現像剤としてマゼンタトナーを含むマゼンタトナー、シアントトナーを含むシアントトナー、イエロートナーを含むイエロートナー、およびブラックトナーを含むブラックトナーを用い、各トナーが体積平均粒径3〜7.5μmを有しながら、少なくともマゼンタトナー、シアントトナー、イエロートナー、およびブラックトナーの重量部、重量平均分子重1000〜3000および重量平均分子重/数平均分子重2.0以下の重合物 (B) 1〜20重量部および着色剤を含むマゼンタトナー、シアントトナー、イエロートナー、およびブラックトナーの複色剤を有するフルカラー画像形成方法。

【特許請求の範囲】

【請求項1】 静電潜像担持体上に潜像を形成し、該潜像を現像剤で現像する工程、および静電潜像担持体上に形成されたトナー像を中間転写体を介してまたは介さずに被記録材上に転写する工程を、現像剤の色ごとに繰り返して行う、被記録材上に転写されたトナー像を定着することを有するフルカラー画像形成方法であって、現像剤としてマゼンタトナーを含むマゼンタトナー、シアントトナーを含むシアントトナー、イエロートナーを含むイエロートナー、およびブラックトナーを含むブラックトナーを用い、  
各トナーが体積平均粒径3〜7.5μmを有しながら、少なくともマゼンタトナー、シアントトナー、重量平均分子重1000〜3000および重量平均分子重/数平均分子重2.0以下の重合物 (B) 1〜20重量部および着色剤を含んでなり、マゼンタトナー、シアントトナーおよびイエロートナーの被記録材に対する最大付着量をそれぞれ5.0g/㎡以下の値に制御することを特徴とするフルカラー画像形成方法。  
【請求項2】 マゼンタトナー、シアントトナーおよびイエロートナーの被記録材に対する最大付着量を5.0g/㎡以下の同一の値に制御することを特徴とする請求項1に記載のフルカラー画像形成方法。  
【請求項3】 重合物 (B) が、芳香族モノマーおよび/または脂肪族モノマーの異種重合物または共重合体である請求項1または2に記載のフルカラー画像形成方法。  
【請求項4】 バインダー樹脂のガラス転移点T<sub>g</sub>が50〜60℃である請求項1〜3いずれかに記載のフルカラー画像形成方法。  
【請求項5】 マゼンタトナー、シアントトナーおよびイエロートナーの後処理剤の種類および量が略同一である請求項1〜4いずれかに記載のフルカラー画像形成方法。  
【発明の詳細な説明】  
【0001】  
【発明の属する技術分野】 本発明はフルカラー画像形成方法に関する。  
【0002】  
【従来の技術】 フルカラー画像形成方法には、静電潜像担持体 (感光体) 上に潜像を形成し、該潜像をトナーで現像する工程 (現像工程)、静電潜像担持体上に形成されたトナー像を中間転写体を介してまたは介さずに被記録材上に転写する工程 (転写工程)、および被記録材上のトナー像を定着する工程 (定着工程) を含んでなる。詳しくは、マゼンタ色、イエロー色、シアント色およびブラック色の4色のトナーを用い、各色ごとに現像を行い、被記録材上にトナー層を重ね合わせた後、加圧および加熱によってトナー層を定着する。このような画像形成方法に使用されるトナーは、少なくともバインダー樹脂および着色剤等を溶解、混練し、冷却した後、粗粉砕および微粉砕し、所望により分級して得るのが一般的

である。

【0003】 近年、上記のようなフルカラー画像形成方法の分野では画像の高画質ならびに画像形成の高速化および低コスト化が要求されており、画像形成プロセスおよびトナーについて様々な試みがなされている。

【0004】 例えば、画像の高画質を達成するためにトナーの平均粒径を小さくすることが有効であることが知られている。しかしながら、トナーの小粒径によりトナーの比表面積が増大するため、単位重量あたりのトナー帯電量が高くなる傾向があった。帯電量が高くなりすぎると、現像量が制限されて所望の画像濃度が得られないという問題が生じた。そこで、画像濃度の低下を防止するために、特開平9-114127号公報では、トナーの体積平均粒径、色材含有量、複写紙上のソリッド部のトナー重量を規定する試みがなされている。この規定によれば、色材含有量を上げることにより、小粒径トナーにおいても所望の画像濃度を確保できる。しかしながら、色材含有量を上げると、色材が持つ荷電性によりトナーの荷電性が大きく左右されるため、トナーごとに現像条件、特に、被記録材に対するトナーの最大付着量を比較的大きく変更する必要がある。トナーごとの被記録材に対するトナーの最大付着量の差が大きすぎると、現像時におけるトナーごとの条件設定が煩雑であり、フルカラー画像形成の高速化と低コスト化を達成できない。また、トナー製造時において、トナーごとに色材以外の材料で荷電量の調整を行う必要があった。

【0005】 また、粉砕工程においては、微粉砕工程が比較的長時間を要していたが、トナーの小粒径化は微粉砕にさらに長時間を要し、生産性が低下し、結果として低コスト化を達成することは困難であった。そこで、特開平11-65161号公報では混練前のトナー組成物に特定の石油樹脂を含有させてトナー組成物の粉砕性を向上させる技術が報告されている。ここでは、バインダー樹脂としてトナーの保存安定性を確保するため、ガラス転移点T<sub>g</sub>が60℃以上の樹脂が使用される。しかしながら、当該技術によるトナーを用いると定着に比較的に長時間を要し、フルカラー画像形成の高速化は達成されなかった。

【0006】 フルカラー画像形成の高速化を達成するために、トナーの色材含有量を増やして被記録材に対するトナーの付着量を低減すること、およびトナーバインダー樹脂の溶解開始温度を下げることが提案されている。しかしながら、トナーの付着量を低減すると、画素あたりの構成トナー数が減少するため、得られる画像の粒状性が悪化するという問題があった。すなわち、キメの粗い画像が得られた。また、溶解開始温度が比較的低いバインダー樹脂を用いると、トナー凝集が起こり易いという問題があった。すなわち、トナーを比較的高温下で保存した時に凝集が起こったり、現像器内において規

より凝集が起こった。







様にして、再び感光体ドラム上の一次帯電器による帯電、シアン画像信号を用いた画像露光による感光体ドラム上の静電潜像の形成、シアントナーを含む現像剤による該静電潜像の現像を行った後、上記のマゼンタトナー像が転写されている被記録材へのシアントナー像の転写を行う。更に、イエロートナー像の形成及びブラックトナー像の形成を順次、上記のマゼンタトナー画像を被記録材と同様に転写し、4色のカラートナー画像を被記録材に転写し、転写されたフルカラー画像を定着ローラー等による加圧および加熱によって定着する。

【0056】各カラー画像の形成順序は変更しても特に問題はない。また、上記説明においては、被記録材へ直接的に各カラートナー画像を順次転写する構成を示したが、中間転写ベルト等の中間転写体へ各カラートナー画像を重ね合わせて順次転写した後、重ね合わせた画像を一括して被記録材へ転写しても良い。

【0057】本発明のフルカラー画像形成方法を表裏に実装するに際しては、当該方法を採用した装置の使用環境（温度、湿度等）の変化に伴い、感光体の電導や現像剤の帯電特性が変動し、「感光体最大付着量（トナーの被記録材に対する最大付着量）」が変動することがあるため、定期的に複数の異なる色のトナーのそれぞれについて自動調整制御（感光体最大付着量の自動制御）を行うことが好ましい。

【0058】自動調整制御とは、所定の現像条件により静電潜像担持体上に基調トナー像（ベタ画像）を形成し、該基調トナー像の付着量に基づいて静電潜像担持体における高電位部の電位および非画像部の電位、現像剤担持体の表面電位等の可変な現像条件を適宜変更することにより、感光体最大付着量を規定の値に補正することである。

【0059】好ましい態様においては、上記自動調整制御を行う一方で、一定周期毎に、所定の条件で電導された静電潜像担持体の表面電位を表面電位測定手段により測定し、その測定値を記憶手段に記憶させるとともに、該測定値と記憶手段に記憶されている前回の測定値とを比較し、その変動量が所定の値よりも大きい場合には前記自動調整制御を実行し、所定の値よりも小さい場合には前記自動調整制御を実行せずに前回の現像条件を維持する。

【0060】好ましい態様においては、上記自動調整制御を実行するときは、1枚目の画像が出力するまでに数十秒の待ち時間が発生するが、上記のような静電潜像担持体の表面電位の変動量に依じた制御を行うと、比較的效果の小さい自動調整制御は行われなくなり、結果として自動調整制御の実行回数が有効に低減されるため、作業能率が向上する。

【0061】本発明の方法においては、上記の好ましい態様を組み合わせて採用することにより、作業能率のさらなる向上を図りながら、長期にわたって高品質なフルカラー画像を高画質かつ安価で提供できる。

【0062】**【実施例】**（バインダー樹脂（ポリエステル樹脂）の製造）  
温度計、攪拌機、流下式コンデンサおよび蒸発導入管を取り付けたガラス製4つフロラスコに、表1に示す割合でアルキル成分および酸成分を重合開始剤（ジブチル鉛オキサイド）とともに入れた。これをマンitolヒーター中で減圧雰囲気下にて、220℃で攪拌しつつ反応させて、ポリエステル樹脂AおよびA2を得た。得られたポリエステル樹脂は表1に示す通りの特性を有していた。なお、表中、POはポリオキシプロピレン(2,2)-2,2-ビス(4-ヒドロキシフェニル)プロパンを、EOはポリオキシエチレン(2,2)-2,2-ビス(4-ヒドロキシフェニル)プロパンを、TPAはテラフタル酸を、PAはフェマル酸を表す。

【0063】

【表1】

樹脂成分	アクリル成分			Tg (°C)	Tm (°C)	酸価 (KOHmg/g)	水酸価 (KOHmg/g)	粉末性 指数	
	PO	EO	TPA						
A1	1.0	10.0	7.0	2.0	3500	3.6	55.4	98.0	2.2
A2	10.0	1.0	—	9.0	3900	3.8	64.5	100.2	1.8

【0064】（重合体 (B) の製造）

F<sub>3</sub>-フェノール樹脂1.5gを少量ずつ約10分間で滴下した。その後、更に3時間攪拌を続行した。次に5%水酸化ナトリウム水溶液50mlを加えて30分間攪拌し、触媒を分解した後、水を分離し、更に重合油を中性に

トクレーブに仕込み攪拌下に温度を5℃に保ちながらB

・樹脂B1

50

なるまで水洗した後、未反応油および溶媒トルエンを留去し、残渣としてポリスチレン120gを得た。当該ポリマーを樹脂B1とし、物性を表2に示した。

【0065】・樹脂B2  
α-メチルスチレン（純度99.8%）150gおよびトルエン150gをオートクレーブに仕込み攪拌下に温度を5℃に保ちながらF<sub>3</sub>-フェノール樹脂1.5gを少量ずつ約10分間で滴下した。その後、更に3時間攪拌を続行した。次に5%水酸化ナトリウム水溶液50mlを加えて30分間攪拌し、触媒を分解した後、水を分離し、更に重合油を中性になるまで水洗した後、未反応油および溶媒トルエンを留去し、残渣としてポリ-α-メチルスチレン120gを得た。当該ポリマーを樹脂B2とし、物性を表2に示した。

【0066】・樹脂B3  
α-メチルスチレン（純度99.8%）250g、イソプロペニルトルエン250gおよびトルエン600gを三つフロラスコに入れ、攪拌下に三弗葉ホウ素フェノール樹脂を少量ずつ添加し、ドライアイス・アセトン浴で冷却しながら20℃で3時間反応させた。次いで、アルコールを添加して触媒を失活させて除去し、溶媒と未反応モノマーとを追い出したためには濃縮し、残渣としてポリ-α-メチルスチレン-イソプロペニルトルエン共重合体を得た。当該ポリマーを樹脂B3とし、物性を表2に示した。

【0067】・樹脂B4  
α-メチルスチレン（純度99.8%）250g、イソプロペニルトルエン250gおよびトルエン600gを三つフロラスコに入れ、攪拌下に三弗葉ホウ素フェノール樹脂を少量ずつ添加し、ドライアイス・アセトン浴で冷却しながら20℃で3時間反応させた。次いで、アルコールを添加して触媒を失活させて除去し、溶媒と未反応モノマーとを追い出したためには濃縮し、残渣としてポリ-α-メチルスチレン-イソプロペニルトルエン共重合体を得た。当該ポリマーを樹脂B4とし、物性を表2に示した。

【0068】・樹脂B5  
反応時間を2時間とした以外は、樹脂B1と同じ製法でポリスチレンを得た。当該ポリマーを樹脂B5とし、物性を表2に示した。

【0069】・樹脂B6  
反応時間を4.5時間とした以外は、樹脂B2と同じ製法でポリ-α-メチルスチレンを得た。当該ポリマーを樹脂B6とし、物性を表2に示した。

重合体 (B)		Mw	Mn	Mw/Mn	Tg (°C)	粉末性指数
B1	ポリスチレン	1500	1000	1.5	62	0.3
B2	ポリ-α-メチルスチレン	2800	1500	1.9	75	0.5
B3	α-メチルスチレン-イソプロペニルトルエン共重合体	2400	1500	1.6	72	0.5
B4	α-メチルスチレン-イソプロペニルトルエン共重合体	1900	1100	1.7	65	0.3
B5	ポリスチレン	900	650	1.4	40	0.2
B6	ポリ-α-メチルスチレン	3100	1700	1.8	88	0.7

【0070】（顔料マスタースターパッチの製造）フルカラートナーの製造に使用する顔料は以下の方法によって得られた顔料マスタースターパッチとして用いた。各実験例または比較例で使用するバインダー樹脂と顔料の重量比（樹脂：顔料）7:3の割合で加圧ニーダーに仕込み、120℃で1時間濃縮した。冷却後、ハンマーミルで粗粉砕し、顔料含有率30重量%の顔料マスタースターパッチを得た。顔料としてはC.I.Pigment Yellow180（ヘキスト社製）、C.I.Pigment Blue15-3（大日本インキ社製）、C.I.Pigment Red55-1（大日本インキ社製）を用いた。

【0071】トナーM1

ポリエステル樹脂A1および顔料マスタースターパッチを、ポリエステル樹脂A1：100重量部およびC.I.Pigment Red55-1：5重量部となるように用い、これに樹脂B1を10重量部

添加し、ベンジエリミキサーで混合した後、エクストル

ードにより溶融造粒した。得られた造粒物を冷却した

後、粗粉砕および微粉砕して、体積平均粒径5.5μmの粉

砕物を得た。その後、粉砕物を分級して体積平均粒径5.5μmのトナー粒子を得た。このトナー粒子100重量部対

して、疎水性シリカ（H2000；ヘキスト社製）0.9重量

部、疎水性酸化チタン（粒径50nm）0.9重量部、および

チタン酸スズ（粒径50nm）0.9重量部、BET比表面積約2/

2.0重量部を添加し、ベンジエリミキサーで混合処理

した後、マゼンタトナー（M1）を得た。

【0072】トナーY1およびC1

50 顔料マスタースターパッチを変更し、ポリエステル樹脂A1およ





比較例3	比較例2	比較例1	実施例7	実施例6	粒径 ( $\mu\text{m}$ )	トナー組成			付着量 ( $\text{g}/\text{m}^2$ )	評価																												
						重合体(B) 着色剤** 使用量(部)	樹脂 種/部*	油脂		生産性	耐熱 保管性	粒状性	帯電性	低湿 定着性																								
比較例3	比較例2	比較例1	実施例7	実施例6	5	A1	B1/10	6.5	3.5	◎	○	○	◎	△																								
															A1	B1/10	11	◎	○	○	◎	△																
																							A1	B1/10	9	◎	○	○	◎	△								
																															A1	B1/10	8	◎	○	○	◎	△
比較例3	比較例2	比較例1	実施例7	実施例6	5	A1	B1/10	6.5	3.5	◎	○	○	◎	△																								
															A1	B1/10	11	◎	○	○	◎	△																
																							A1	B1/10	9	◎	○	○	◎	△								
																															A1	B1/10	8	◎	○	○	◎	△

\*バインダー樹脂100重量部に対する重合体 (B) の使用量を示す。  
\*\*バインダー樹脂100重量部に対する着色剤の使用量を示す。

比較例5	比較例4		比較例3		比較例2	比較例1	比較例0	比較例6	比較例7	比較例8	比較例9	比較例10	比較例11	比較例12	比較例13	比較例14	比較例15	比較例16	比較例17	比較例18	比較例19	比較例20	比較例21	比較例22	比較例23	比較例24	比較例25	比較例26	比較例27	比較例28	比較例29	比較例30	比較例31	比較例32	比較例33	比較例34	比較例35	比較例36	比較例37	比較例38	比較例39	比較例40	比較例41	比較例42	比較例43	比較例44	比較例45	比較例46	比較例47	比較例48	比較例49	比較例50	比較例51	比較例52	比較例53	比較例54	比較例55	比較例56	比較例57	比較例58	比較例59	比較例60	比較例61	比較例62	比較例63	比較例64	比較例65	比較例66	比較例67	比較例68	比較例69	比較例70	比較例71	比較例72	比較例73	比較例74	比較例75	比較例76	比較例77	比較例78	比較例79	比較例80	比較例81	比較例82	比較例83	比較例84	比較例85	比較例86	比較例87	比較例88	比較例89	比較例90	比較例91	比較例92	比較例93	比較例94	比較例95	比較例96	比較例97	比較例98	比較例99	比較例100	比較例101	比較例102	比較例103	比較例104	比較例105	比較例106	比較例107	比較例108	比較例109	比較例110	比較例111	比較例112	比較例113	比較例114	比較例115	比較例116	比較例117	比較例118	比較例119	比較例120	比較例121	比較例122	比較例123	比較例124	比較例125	比較例126	比較例127	比較例128	比較例129	比較例130	比較例131	比較例132	比較例133	比較例134	比較例135	比較例136	比較例137	比較例138	比較例139	比較例140	比較例141	比較例142	比較例143	比較例144	比較例145	比較例146	比較例147	比較例148	比較例149	比較例150	比較例151	比較例152	比較例153	比較例154	比較例155	比較例156	比較例157	比較例158	比較例159	比較例160	比較例161	比較例162	比較例163	比較例164	比較例165	比較例166	比較例167	比較例168	比較例169	比較例170	比較例171	比較例172	比較例173	比較例174	比較例175	比較例176	比較例177	比較例178	比較例179	比較例180	比較例181	比較例182	比較例183	比較例184	比較例185	比較例186	比較例187	比較例188	比較例189	比較例190	比較例191	比較例192	比較例193	比較例194	比較例195	比較例196	比較例197	比較例198	比較例199	比較例200	比較例201	比較例202	比較例203	比較例204	比較例205	比較例206	比較例207	比較例208	比較例209	比較例210	比較例211	比較例212	比較例213	比較例214	比較例215	比較例216	比較例217	比較例218	比較例219	比較例220	比較例221	比較例222	比較例223	比較例224	比較例225	比較例226	比較例227	比較例228	比較例229	比較例230	比較例231	比較例232	比較例233	比較例234	比較例235	比較例236	比較例237	比較例238	比較例239	比較例240	比較例241	比較例242	比較例243	比較例244	比較例245	比較例246	比較例247	比較例248	比較例249	比較例250	比較例251	比較例252	比較例253	比較例254	比較例255	比較例256	比較例257	比較例258	比較例259	比較例260	比較例261	比較例262	比較例263	比較例264	比較例265	比較例266	比較例267	比較例268	比較例269	比較例270	比較例271	比較例272	比較例273	比較例274	比較例275	比較例276	比較例277	比較例278	比較例279	比較例280	比較例281	比較例282	比較例283	比較例284	比較例285	比較例286	比較例287	比較例288	比較例289	比較例290	比較例291	比較例292	比較例293	比較例294	比較例295	比較例296	比較例297	比較例298	比較例299	比較例300	比較例301	比較例302	比較例303	比較例304	比較例305	比較例306	比較例307	比較例308	比較例309	比較例310	比較例311	比較例312	比較例313	比較例314	比較例315	比較例316	比較例317	比較例318	比較例319	比較例320	比較例321	比較例322	比較例323	比較例324	比較例325	比較例326	比較例327	比較例328	比較例329	比較例330	比較例331	比較例332	比較例333	比較例334	比較例335	比較例336	比較例337	比較例338	比較例339	比較例340	比較例341	比較例342	比較例343	比較例344	比較例345	比較例346	比較例347	比較例348	比較例349	比較例350	比較例351	比較例352	比較例353	比較例354	比較例355	比較例356	比較例357	比較例358	比較例359	比較例360	比較例361	比較例362	比較例363	比較例364	比較例365	比較例366	比較例367	比較例368	比較例369	比較例370	比較例371	比較例372	比較例373	比較例374	比較例375	比較例376	比較例377	比較例378	比較例379	比較例380	比較例381	比較例382	比較例383	比較例384	比較例385	比較例386	比較例387	比較例388	比較例389	比較例390	比較例391	比較例392	比較例393	比較例394	比較例395	比較例396	比較例397	比較例398	比較例399	比較例400	比較例401	比較例402	比較例403	比較例404	比較例405	比較例406	比較例407	比較例408	比較例409	比較例410	比較例411	比較例412	比較例413	比較例414	比較例415	比較例416	比較例417	比較例418	比較例419	比較例420	比較例421	比較例422	比較例423	比較例424	比較例425	比較例426	比較例427	比較例428	比較例429	比較例430	比較例431	比較例432	比較例433	比較例434	比較例435	比較例436	比較例437	比較例438	比較例439	比較例440	比較例441	比較例442	比較例443	比較例444	比較例445	比較例446	比較例447	比較例448	比較例449	比較例450	比較例451	比較例452	比較例453	比較例454	比較例455	比較例456	比較例457	比較例458	比較例459	比較例460	比較例461	比較例462	比較例463	比較例464	比較例465	比較例466	比較例467	比較例468	比較例469	比較例470	比較例471	比較例472	比較例473	比較例474	比較例475	比較例476	比較例477	比較例478	比較例479	比較例480	比較例481	比較例482	比較例483	比較例484	比較例485	比較例486	比較例487	比較例488	比較例489	比較例490	比較例491	比較例492	比較例493	比較例494	比較例495	比較例496	比較例497	比較例498	比較例499	比較例500	比較例501	比較例502	比較例503	比較例504	比較例505	比較例506	比較例507	比較例508	比較例509	比較例510	比較例511	比較例512	比較例513	比較例514	比較例515	比較例516	比較例517	比較例518	比較例519	比較例520	比較例521	比較例522	比較例523	比較例524	比較例525	比較例526	比較例527	比較例528	比較例529	比較例530	比較例531	比較例532	比較例533	比較例534	比較例535	比較例536	比較例537	比較例538	比較例539	比較例540	比較例541	比較例542	比較例543	比較例544	比較例545	比較例546	比較例547	比較例548	比較例549	比較例550	比較例551	比較例552	比較例553	比較例554	比較例555	比較例556	比較例557	比較例558	比較例559	比較例560	比較例561	比較例562	比較例563	比較例564	比較例565	比較例566	比較例567	比較例568	比較例569	比較例570	比較例571	比較例572	比較例573	比較例574	比較例575	比較例576	比較例577	比較例578	比較例579	比較例580	比較例581	比較例582	比較例583	比較例584	比較例585	比較例586	比較例587	比較例588	比較例589	比較例590	比較例591	比較例592	比較例593	比較例594	比較例595	比較例596	比較例597	比較例598	比較例599	比較例600	比較例601	比較例602	比較例603	比較例604	比較例605	比較例606	比較例607	比較例608	比較例609	比較例610	比較例611	比較例612	比較例613	比較例614	比較例615	比較例616	比較例617	比較例618	比較例619	比較例620	比較例621	比較例622	比較例623	比較例624	比較例625	比較例626	比較例627	比較例628	比較例629	比較例630	比較例631	比較例632	比較例633	比較例634	比較例635	比較例636	比較例637	比較例638	比較例639	比較例640	比較例641	比較例642	比較例643	比較例644	比較例645	比較例646	比較例647	比較例648	比較例649	比較例650	比較例651	比較例652	比較例653	比較例654	比較例655	比較例656	比較例657	比較例658	比較例659	比較例660	比較例661	比較例662	比較例663	比較例664	比較例665	比較例666	比較例667	比較例668	比較例669	比較例670	比較例671	比較例672	比較例673	比較例674	比較例675	比較例676	比較例677	比較例678	比較例679	比較例680	比較例681	比較例682	比較例683	比較例684	比較例685	比較例686	比較例687	比較例688	比較例689	比較例690	比較例691	比較例692	比較例693	比較例694	比較例695	比較例696	比較例697	比較例698	比較例699	比較例700	比較例701	比較例702	比較例703	比較例704	比較例705	比較例706	比較例707	比較例708	比較例709	比較例710	比較例711	比較例712	比較例713	比較例714	比較例715	比較例716	比較例717	比較例718	比較例719	比較例720	比較例721	比較例722	比較例723	比較例724	比較例725	比較例726	比較例727	比較例728	比較例729	比較例730	比較例731	比較例732	比較例733	比較例734	比較例735	比較例736	比較例737	比較例738	比較例739	比較例740	比較例741	比較例742	比較例743	比較例744	比較例745	比較例746	比較例747	比較例748	比較例749	比較例750	比較例751	比較例752	比較例753	比較例754	比較例755	比較例756	比較例757	比較例758	比較例759	比較例760	比較例761	比較例762	比較例763	比較例764	比較例765	比較例766	比較例767	比較例768	比較例769	比較例770	比較例771	比較例772	比較例773	比較例774	比較例775	比較例776	比較例777	比較例778	比較例779	比較例780	比較例781	比較例782	比較例783	比較例784	比較例785	比較例786	比較例787	比較例788	比較例789	比較例790	比較例791	比較例792	比較例793	比較例794	比較例795	比較例796	比較例797	比較例798	比較例799	比較例800	比較例801	比較例802	比較例803	比較例804	比較例805	比較例806	比較例807	比較例808	比較例809	比較例810	比較例811	比較例812	比較例813	比較例814	比較例815	比較例816	比較例817	比較例818	比較例819	比較例820	比較例821	比較例822	比較例823	比較例824	比較例825	比較例826	比較例827	比較例828	比較例829	比較例830	比較例831	比較例832	比較例833	比較例834	比較例835	比較例836	比較例837	比較例838	比較例839	比較例840	比較例841	比較例842	比較例843	比較例844	比較例845	比較例846	比較例847	比較例848	比較例849	比較例850	比較例851	比較例852	比較例853	比較例854	比較例855	比較例856	比較例857	比較例858	比較例859	比較例860	比較例861	比較例862	比較例863	比較例864	比較例865	比較例866	比較例867	比較例868	比較例869	比較例870	比較例871	比較例872	比較例873	比較例874	比較例875	比較例876	比較例877	比較例878	比較例879	比較例880	比較例881	比較例882	比較例883	比較例884	比較例885	比較例886	比較例887	比較例888	比較例889	比較例890	比較例891	比較例892	比較例893	比較例894	比較例895	比較例896	比較例897	比較例898	比較例899	比較例900	比較例901	比較例902	比較例903	比較例904	比較例905	比較例906	比較例907	比較例908	比較例909	比較例910	比較例911	比較例912	比較例913	比較例914	比較例915	比較例916	比較例917	比較例918	比較例919	比較例920	比較例921	比較例922	比較例923	比較例924	比較例925	比較例926	比較例927	比較例928	比較例929	比較例930	比較例931	比較例932	比較例933	比較例934	比較例935	比較例936	比較例937	比較例938	比較例939	比較例940	比較例941	比較例942	比較例943	比較例944	比較例945	比較例946	比較例947	比較例948	比較例949	比較例950	比較例951	比較例952	比較例953	比較例954	比較例955	比較例956	比較例957	比較例958	比較例959	比較例960
------	------	--	------	--	------	------	------	------	------	------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

\*バインダー樹脂100重量部に対する重合体 (B) の使用量を示す。  
\*\*バインダー樹脂100重量部に対する着色剤の使用量を示す。

管、滴下装置を備えた容量50mlのフラスコにメチルエチルケトンに100重量部仕込んだ、薬液を室温下80℃でメチルメタクリレート86.7重量部、2-ヒドロキシエチルメタクリレート5.1重量部、3-メタクリロキシプロピルトリリス (トリメチルシリロキシ) シラン88.2重量部および、1'-アゾビス (シクロヘキサノール-1-カルボニトリル) 1重量部を、メチルエチルケトン100重量部に溶解させて得られた溶液を2時間におたり反た器中に滴下し、5時間熟成させた。得られた樹脂に対して、架橋剤としてインホロンジメチルシリコンエーノートリメチロールプロパンアダクト (IPDI/TMP系：NCO%≒6.1%) を0.1/100重量比で添加し、1/1となるように調整した後メチルエチルケトンで希釈して固定比8重量%であるコート樹脂溶液を調製した。

【0088】 コア材として合成フェライト粉F-800 (体積平均粒径：50μm、バクダテック社製) を用い、上記コート樹脂溶液をコア材に対する被覆樹脂量が1.5重量%になるようにスピンコート (岡田精工社製) により塗布・乾燥した。得られたキャリアを熱風循環式オーブンにて160℃で1時間放置して焼成した。冷却後フェライト粉バルクを目盛り106μmと75μmのスクリーンメッシュを取り付けたフルイ振とう器を用いて解砕し、アクリル変性シリコンコンフォートフェライトキャリアを得た。

【0089】 (他の測定方法)

・樹脂の軟化点の測定方法  
フローテスター (CFT-500; 島津製作所社製) を用い、ダイスの細孔 (径1mm、長さ1mm)、加圧30kg/cm<sup>2</sup>、昇温速度3℃/minの条件で1cm<sup>3</sup>の試料を溶融流出させたときの流出開始点から流出終了点の高さの1/2に相当する温度を軟化点とした。

・酸価は、10mgの試料をトルエン50mlに溶解し、0.1%のプロムチンモルブリンとフェノールレッドの混合指示薬を用いて、予め調整されたN/10水酸化カリウム/アルコール溶液で滴定し、N/10水酸化カリウム/アルコール溶液の消費量から算出した値である。

【0090】 ・トナーの粒径はコールターマルチサイザー-IIを用いて測定した。

・無機微粒子の平均粒径は透過型電子顕微鏡 (TEM-1010型; 日本電子株式会社) で観察し、粒子100個の直径を測定し、平均粒径を求めた。

【0091】

【0087】 (アクリル変性シリコンコンフォートフェライトの製造) 攪拌器、コンデンサー、温度計、薬液導入

(15) 特開2002-131973

フロントページの概略

(51)Int. Cl. 7 識別記号  
G 0 3 G 15/01 113

F I  
G 0 3 G 9/08 361

7-75-1 (参考)

(72)発明者 安野 政裕  
大阪府大阪市中央区安土町二丁目3番13号  
大阪国鉄ビル ミノルタ株式会社内

Fターム(参考) 2H05 AA01 AA06 AA08 AA21 CA04  
CA21 EA03 EA05 EA06 EA07  
2H030 AD01 BB36